Monitoring the condition of Great Lakes Coastal regions: role of standardized monitoring programs

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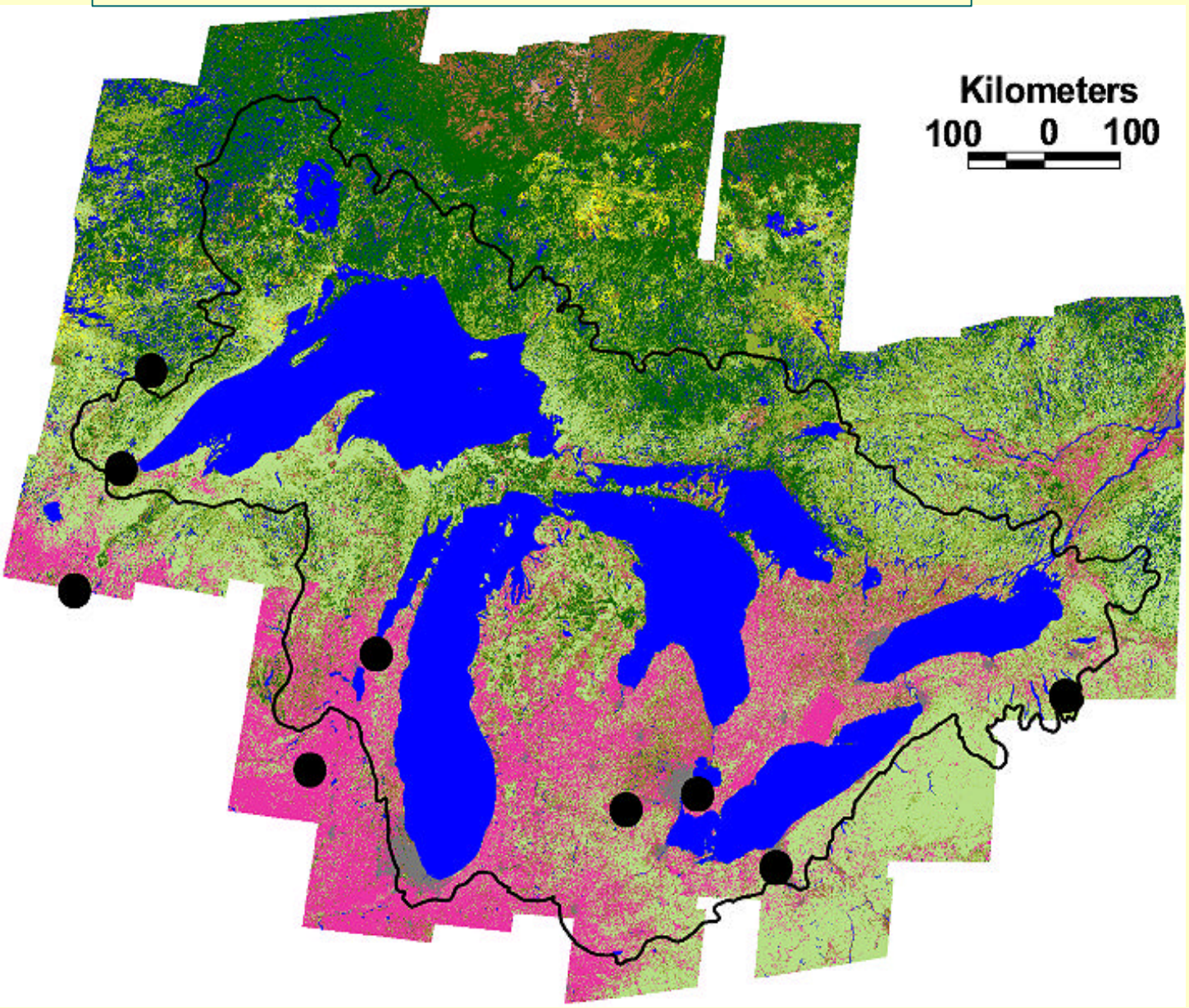
Great Lakes Environmental Indicators Project



Acknowledgements

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GLEI Objectives

- Develop the science of indicators in the Great Lakes coastal region
- Science-linking response to stressors
- Work with existing organizations (SOLEC) to recommend indicators
- Work with organizations to develop/promote monitoring programs

Background

- Birds have a long history and demonstrated use as environmental indicators in many ecosystems
- Although amphibians appear to be sensitive to several types of environmental stressors, these relationships are largely a science in process
- Development of community “IBI’s” for both groups are relatively recent

Hypotheses

- Wetland breeding bird and amphibian communities/guilds/species can be used to indicate the condition of Great Lakes coastal wetlands at a variety of scales to a variety of stressors
- Upland breeding bird communities/guilds/species can be used to assess the condition of coastal lands/watersheds within the Great Lakes basin at a variety of scales to a variety of stressors

Bird/amphibian: Potential Pressure Indicators (stressors)

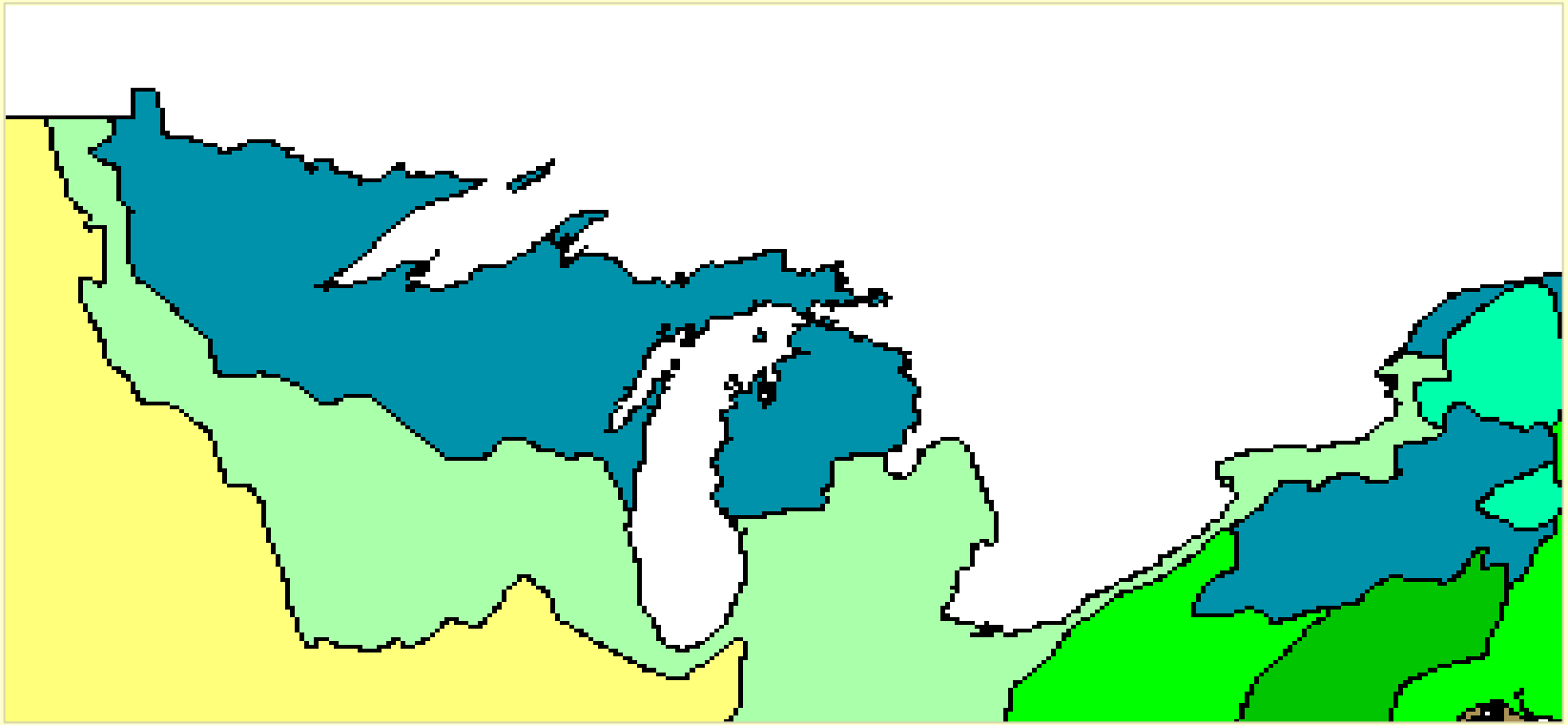
- Habitat alteration: fragmentation, land conversion
- Biotic processes: exotic species
- Hydrologic Disturbance: water table levels and fluctuation
- Nutrient load

Bird/amphibian indicators: scale of application/development

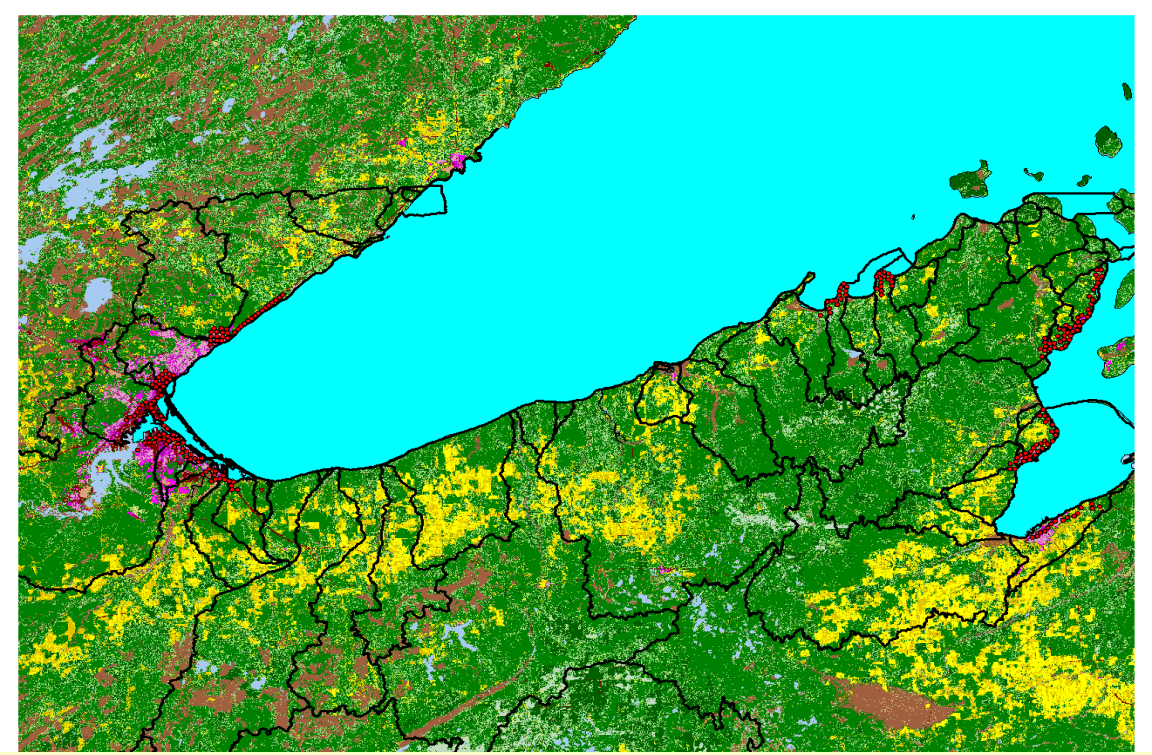
- Within GLEI: overlap of sampling will allow multi-metric indicator
- Within Great Lakes Region: Better science for SOLEC indicators and development of novel indicators
- National: work with other EAGLES to develop national bird IBI's

Hierarchical sampling scheme

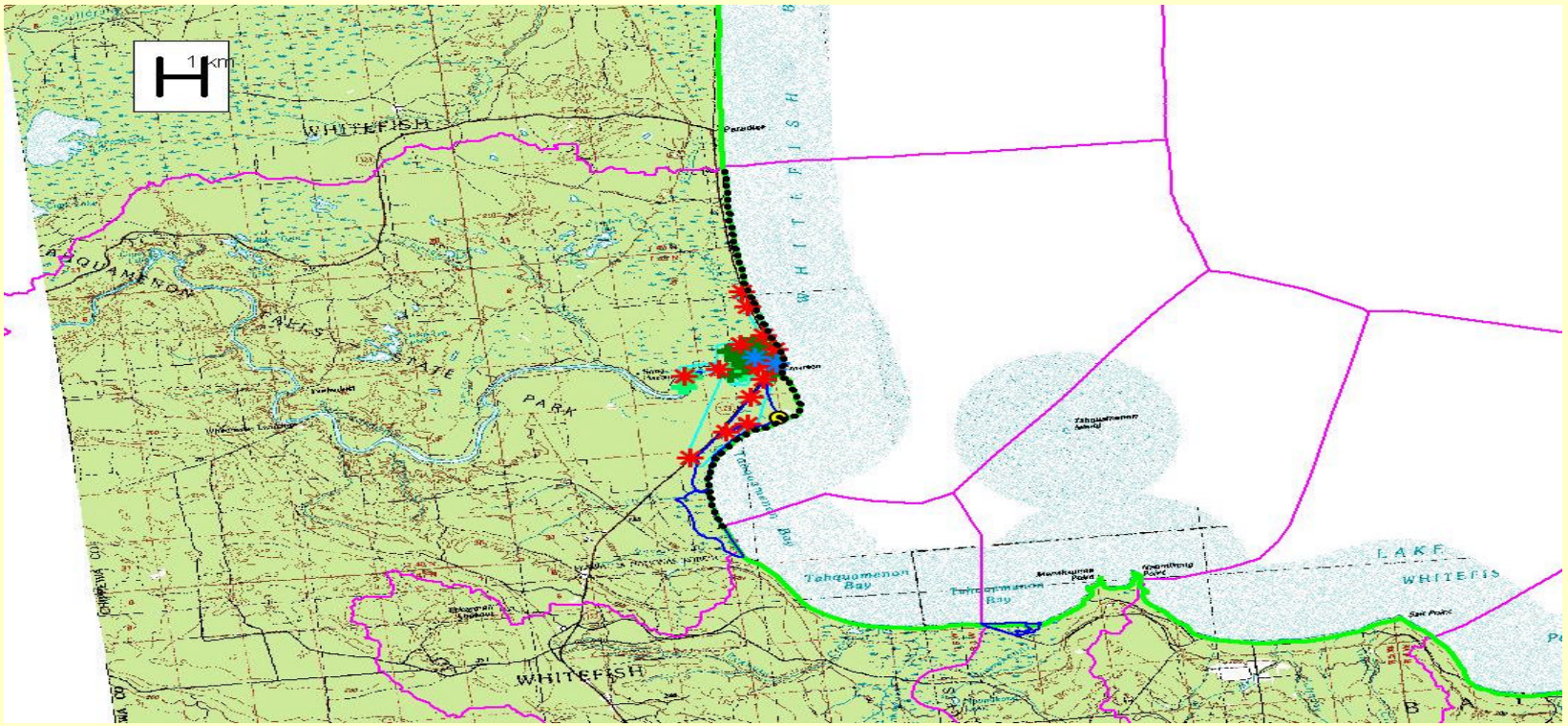
Two Provinces



762 Reaches/reachsheds

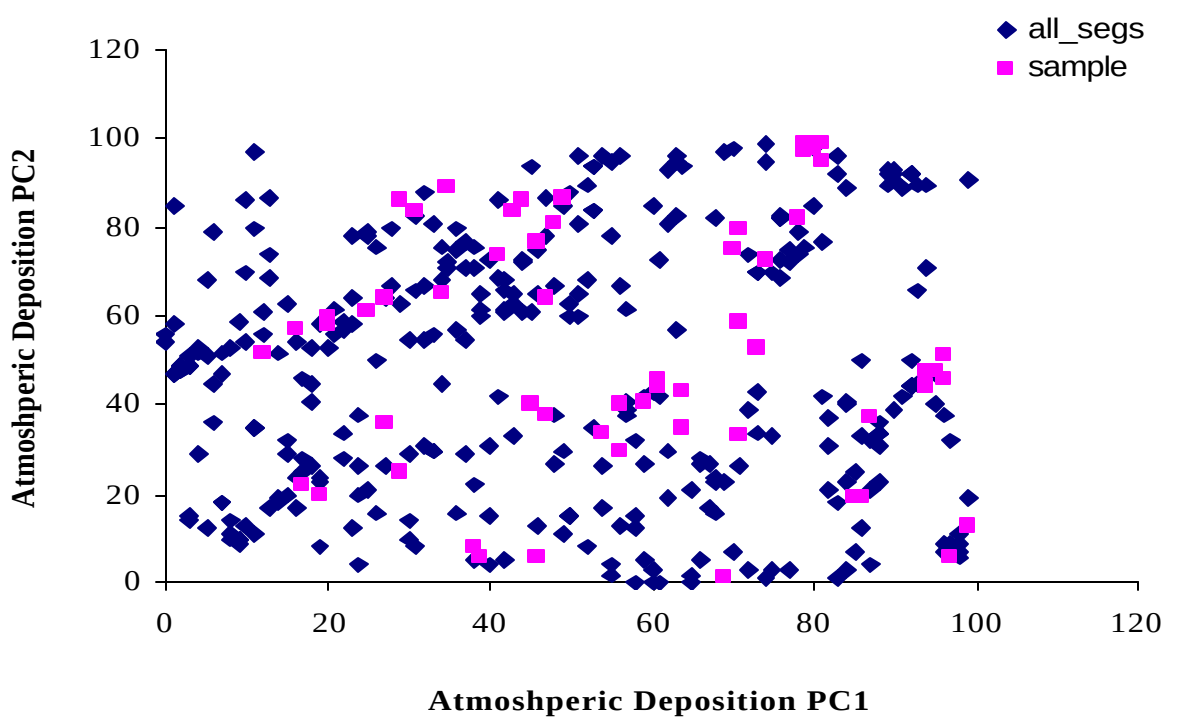


Methods: upland and wetland ecosystems were sampled

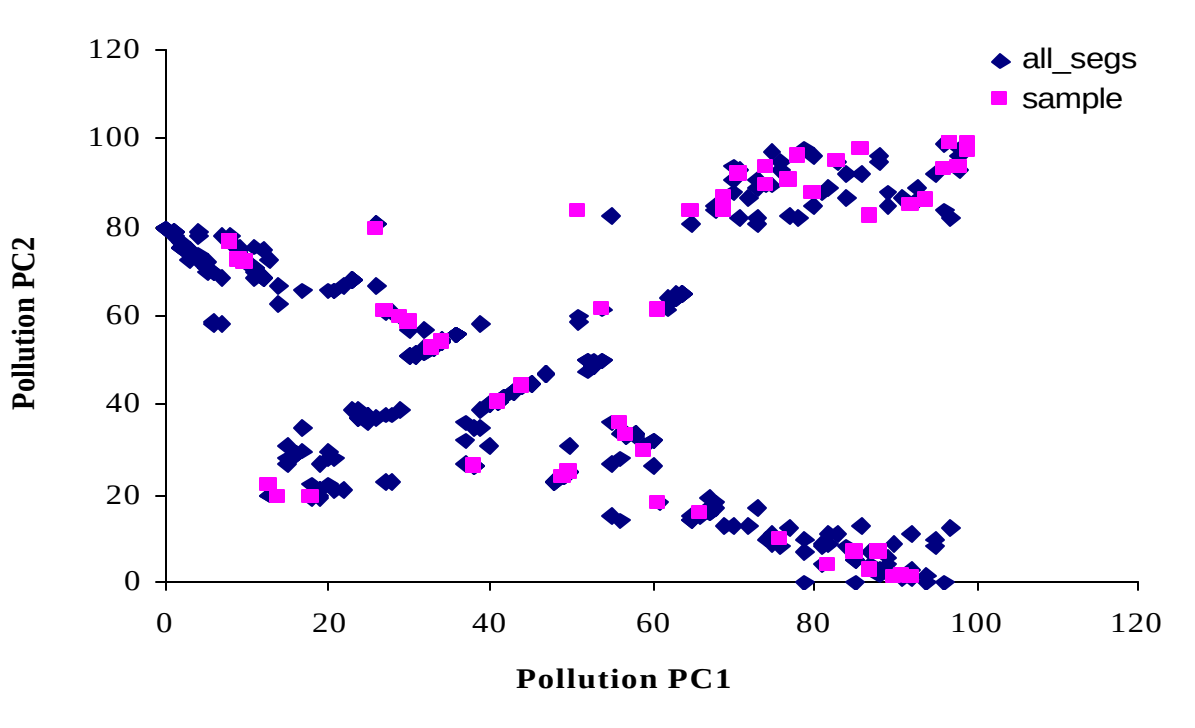


Sample across disturbance gradients

Methods: sites were chosen to span 7 disturbance gradients



Distribution of uplands sampled

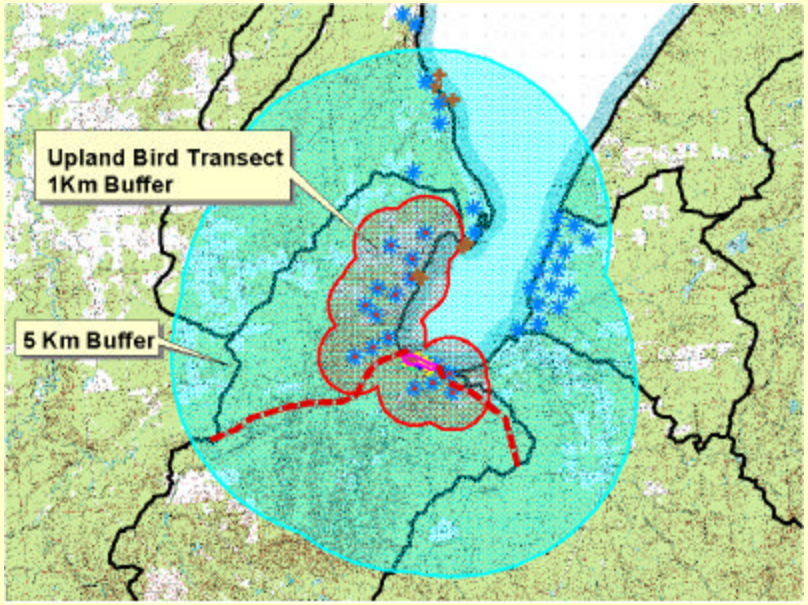


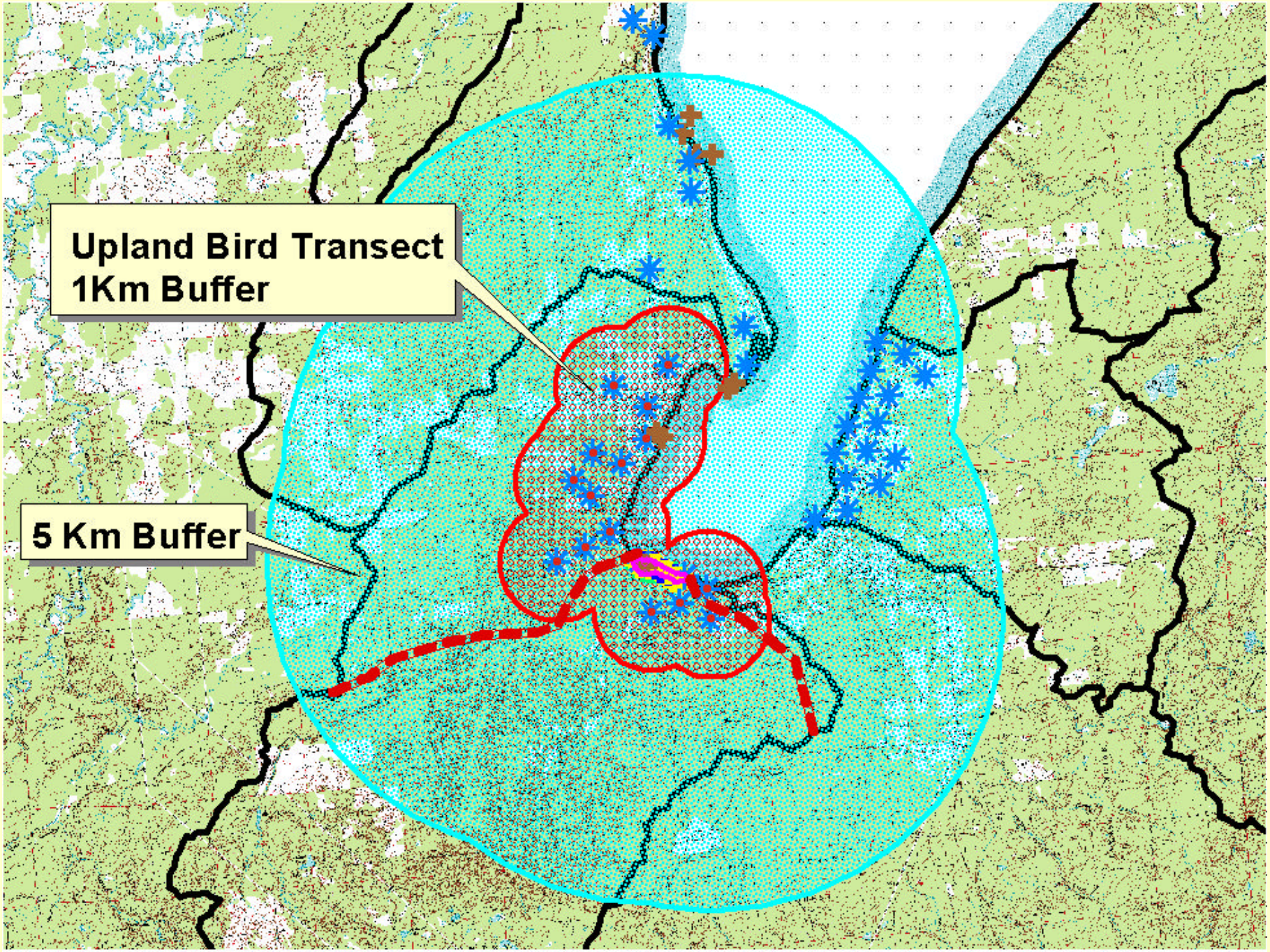
Methods: sampled with nationally standardized methods IMPORTANT

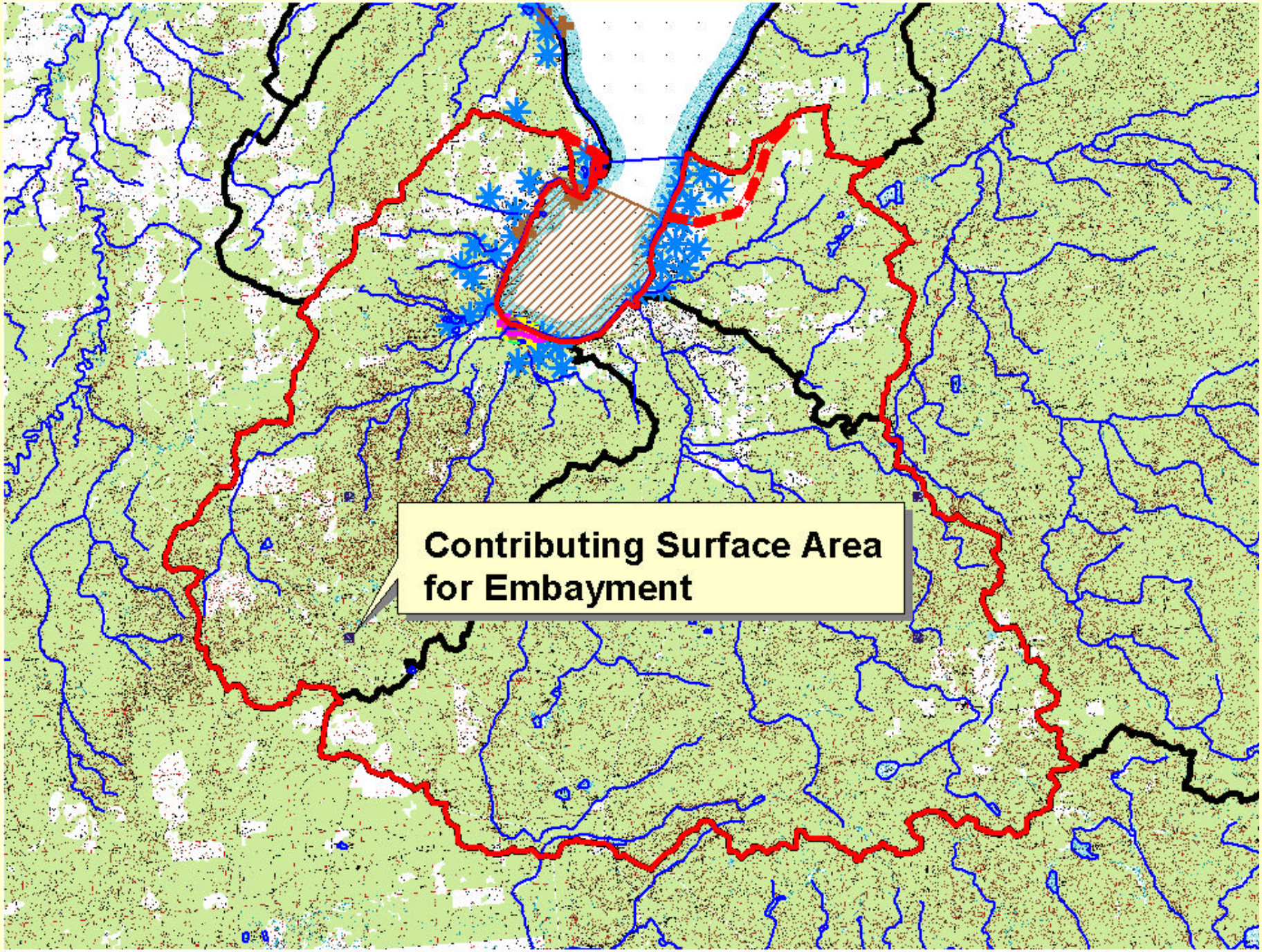
- Wetland birds/amphibians sampled at most or all accessible wetlands across the Lakes (n>230)
- Uplands sampled along 180 coastal segments

Scale of response

- Likely that different animals will respond to stress at different scales
- Lot's of ways to quantify stressors at multiple scales




Upland Bird Transect
1Km Buffer
5 Km Buffer


Contributing Surface Area
for Embayment

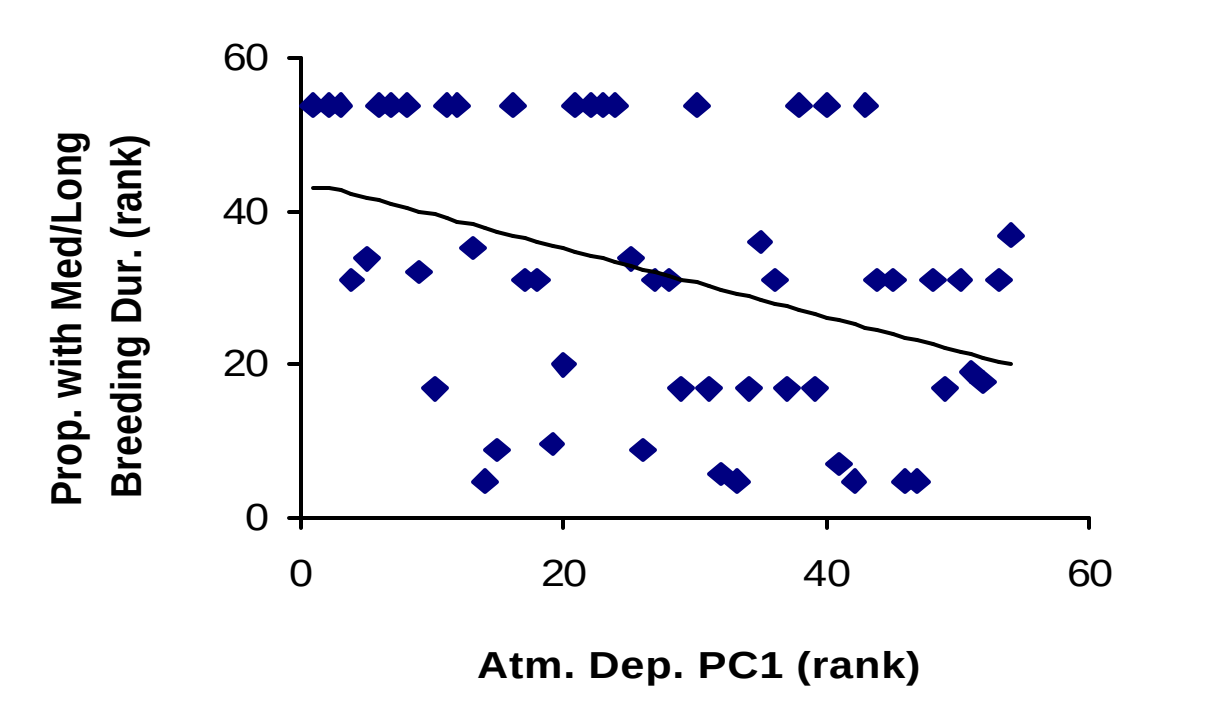
Preliminary Results

- Subset of data, Province 212
- Ranked correlations with principal components used to define stressor gradients
- Small subset of bird/amphibian indicator metrics

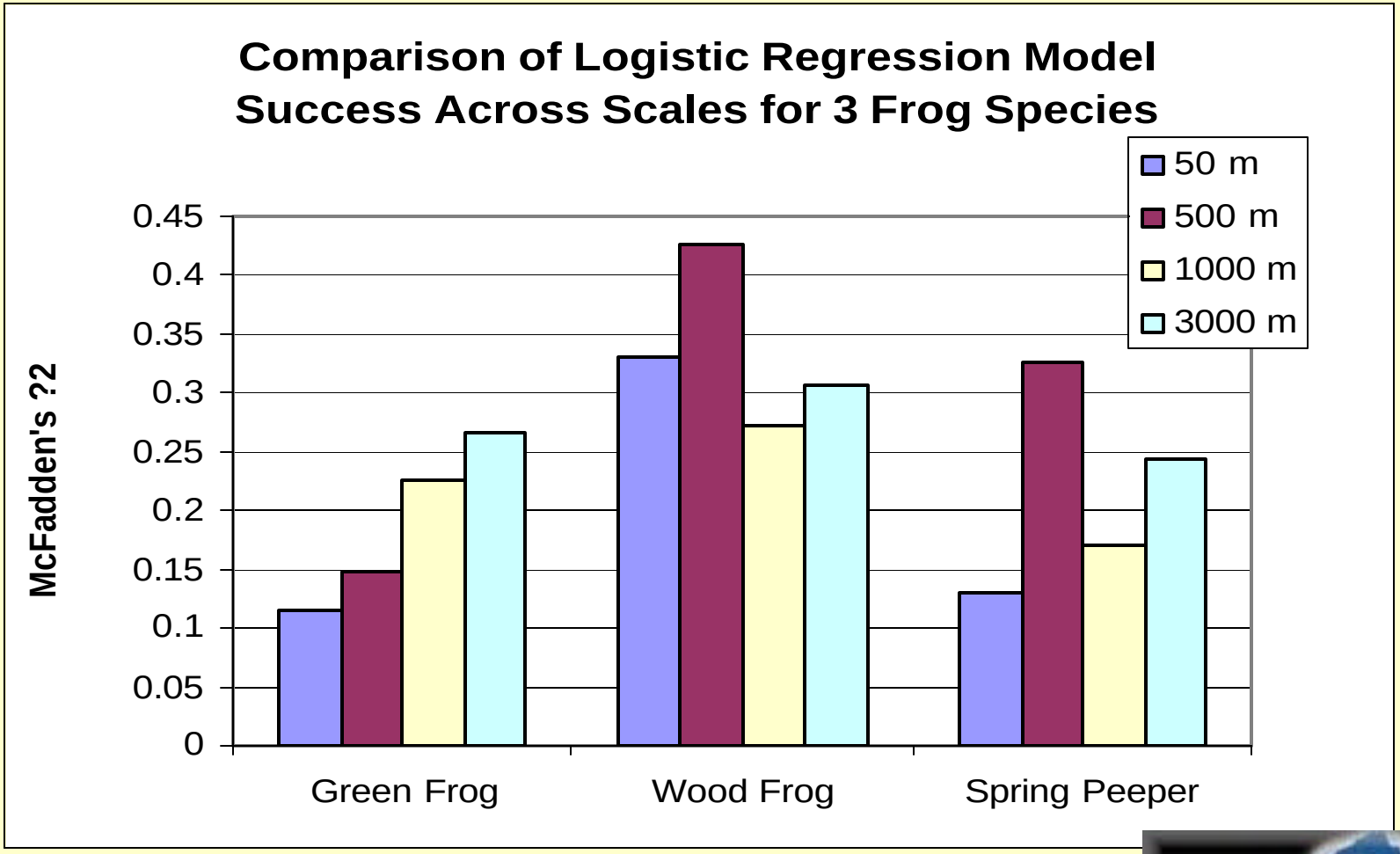
Summary:correlations with PCs

PC1	Upland bird	Wetland bird	Amphibian
Agriculture/ Chemicals	% warblers (-0.76)	%SDM (0.68)	Breed dur-ation (-0.19)
Atmospheric deposition	% warblers (-0.69)	% swallows (0.51)	Egg devel time (0.39)
Land Cover	% urban (0.73)	%SDM (0.62)	Time maturity (-0.17)
Population density	% urban (0.75)	% SDM (0.57)	Larval devel (-0.18)
Point Source	%LDM (-0.53)	%SDM (0.51)	Time maturity (-0.18)
Shoreline protection	%warblers (-0.74)	%SDM (0.43)	Egg devel (0.18)
Soils	#forage guilds (0.43)	%SDM (-0.36)	Time maturity (0.51)

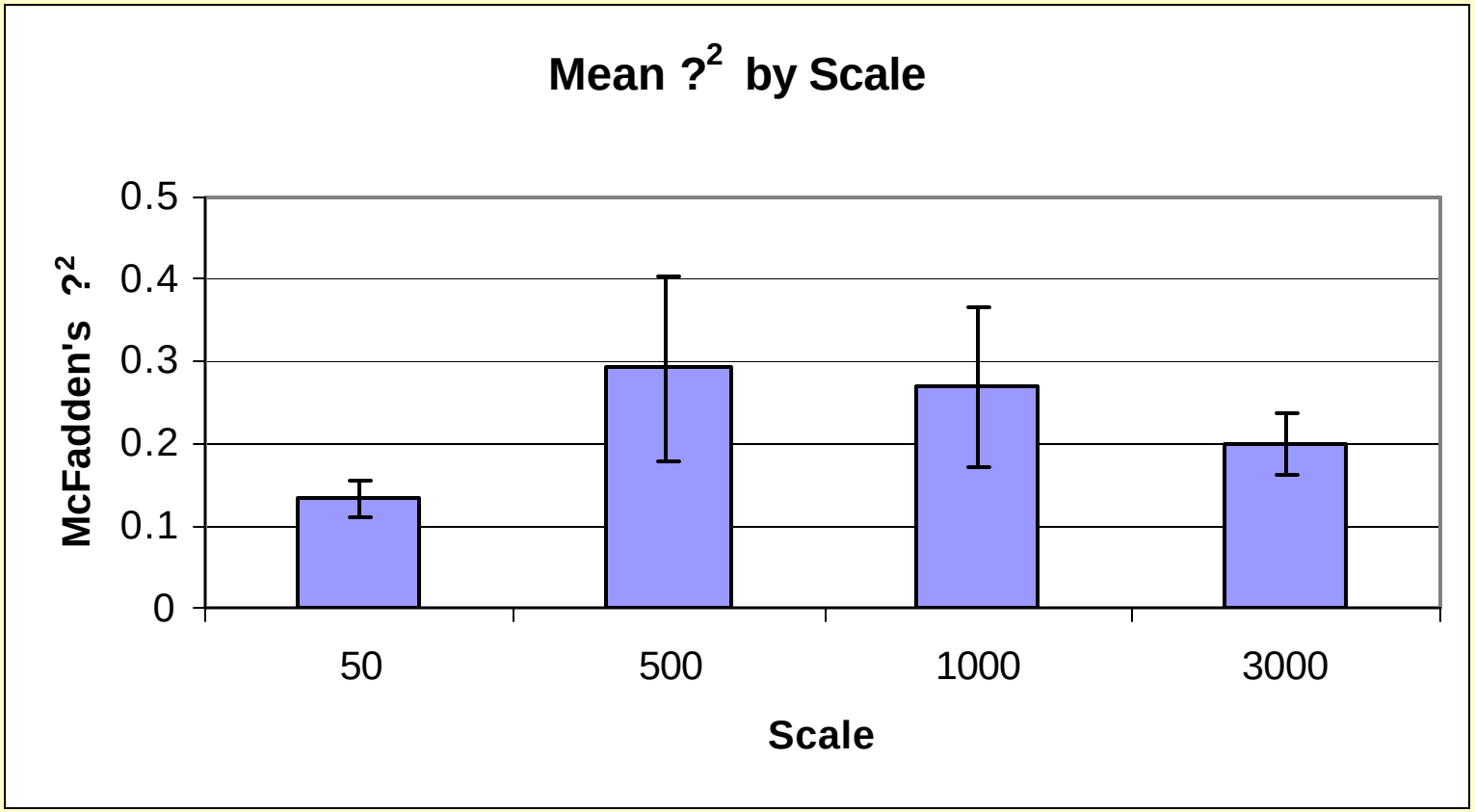
Anuran Example R_s=-0.39



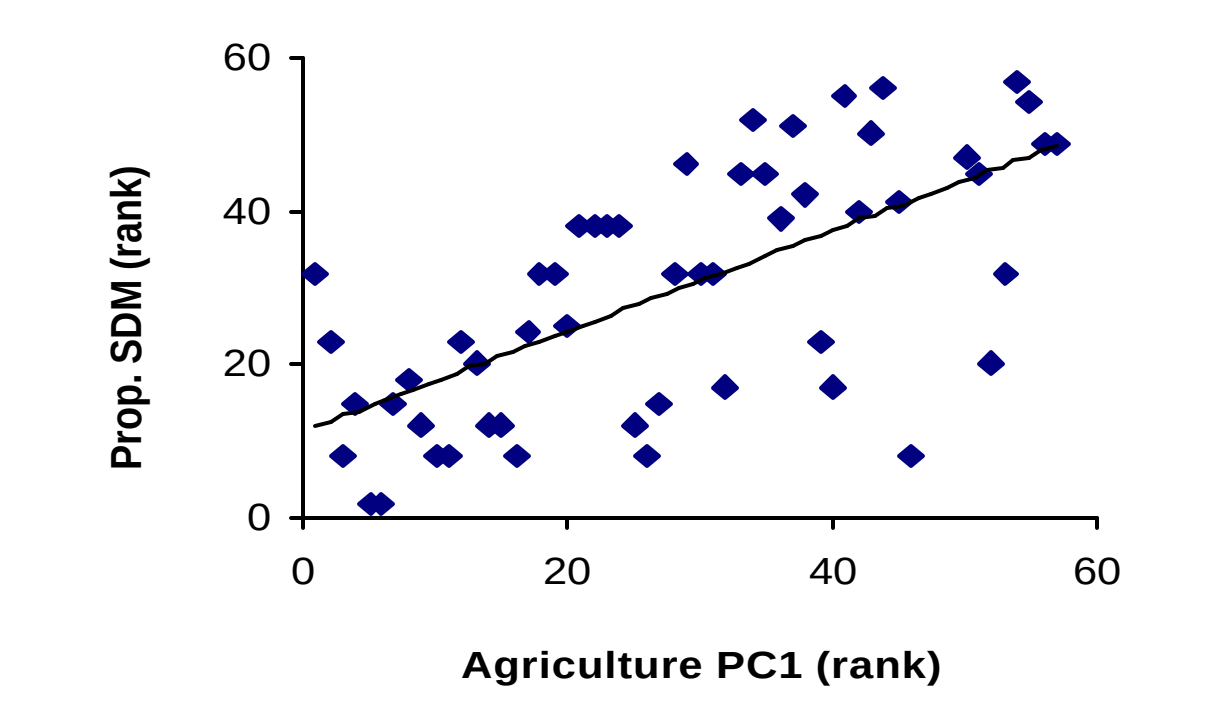
Anuran species: Response Scale



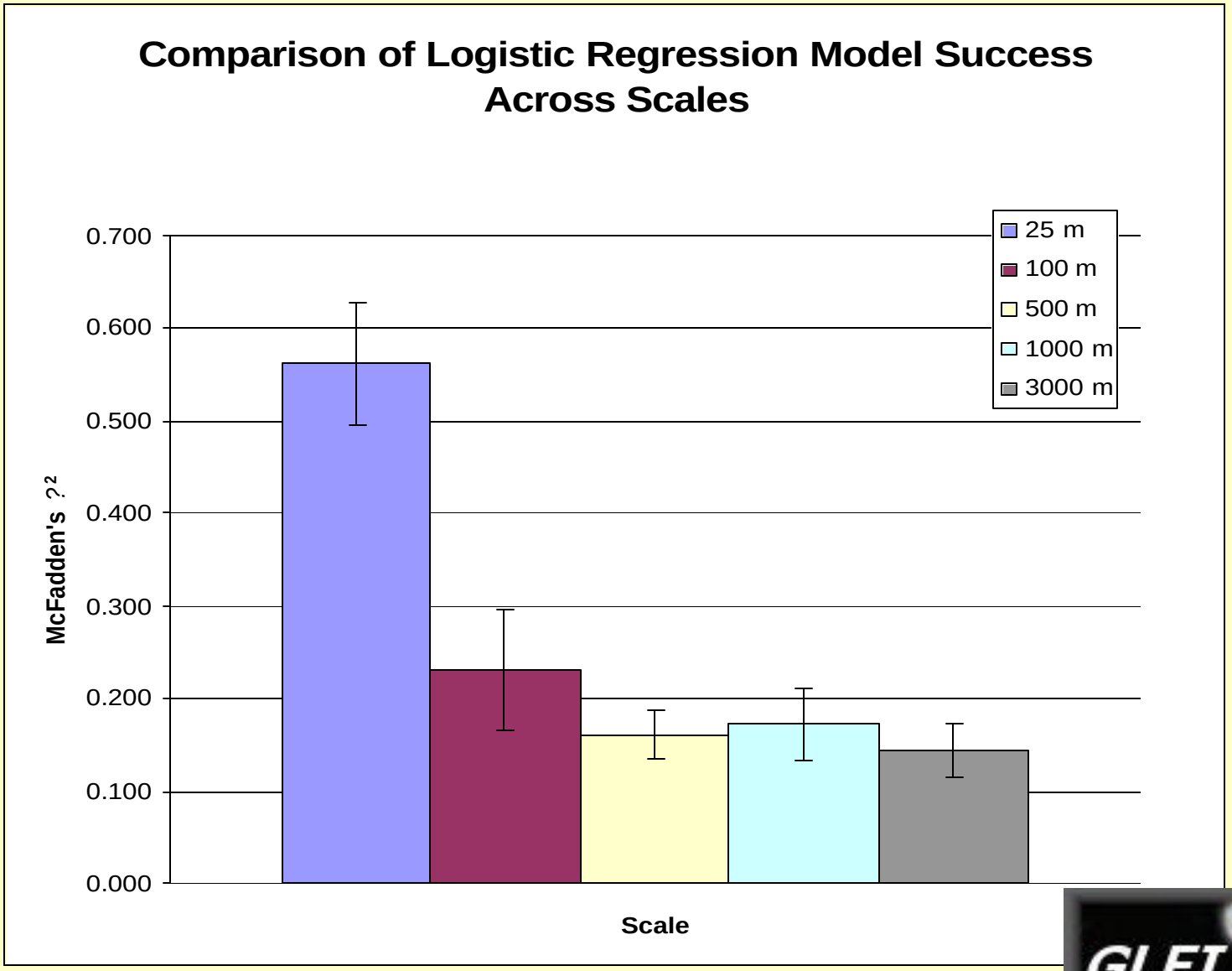
Anurans: Logistic Regression



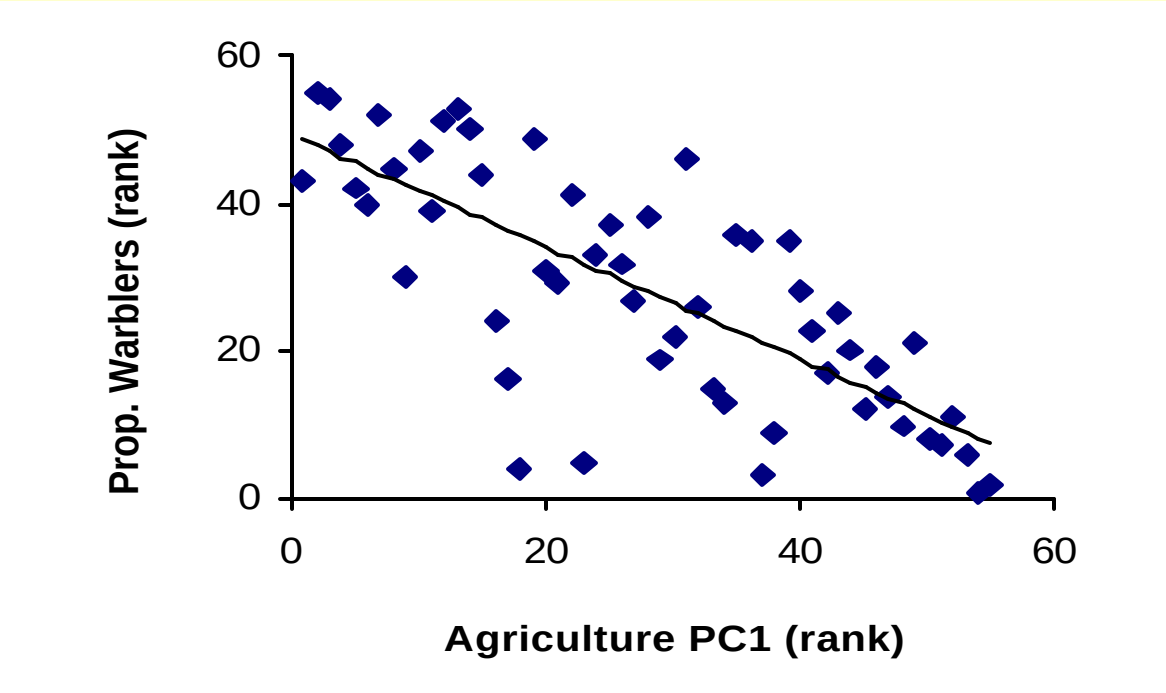
Wetland Bird Example R_s=0.68



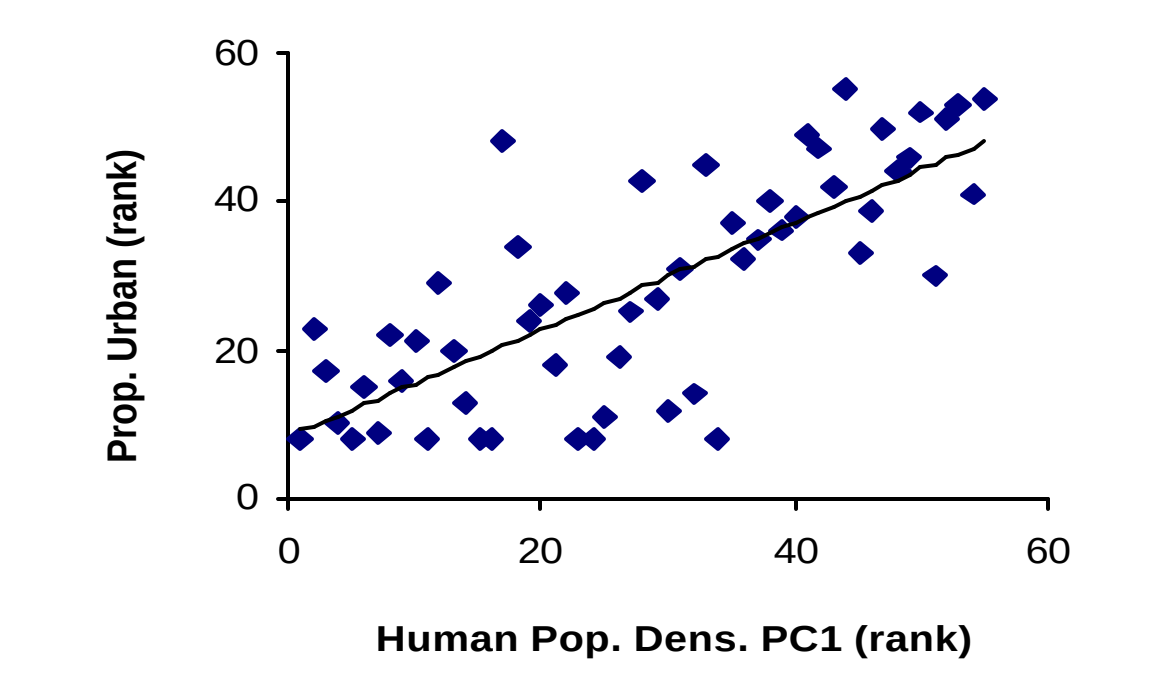
Wetland bird: response scale



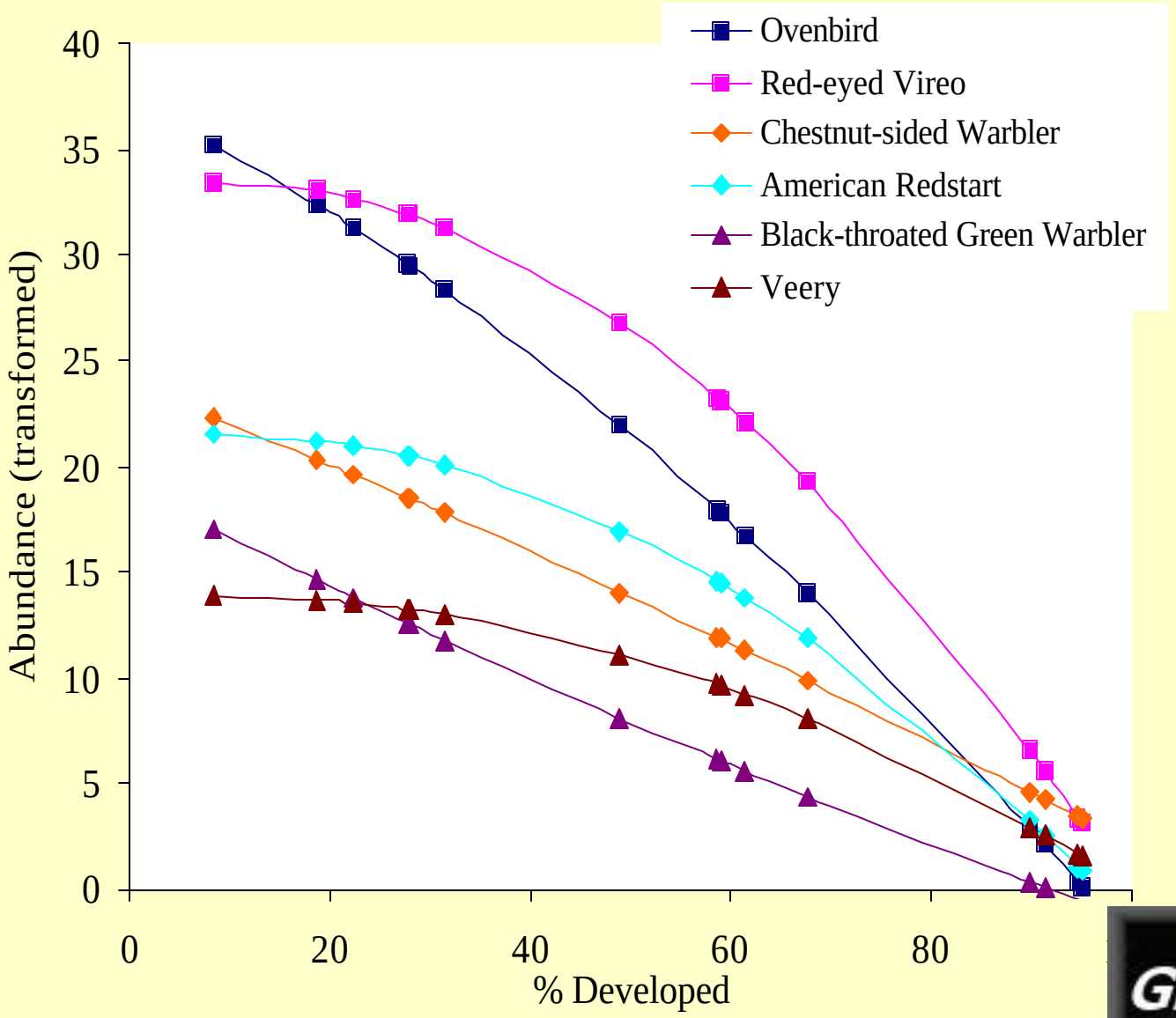
Upland Bird Example R_s=-0.70



Upland Bird Example R_s=0.75



Upland Birds: Response Scale

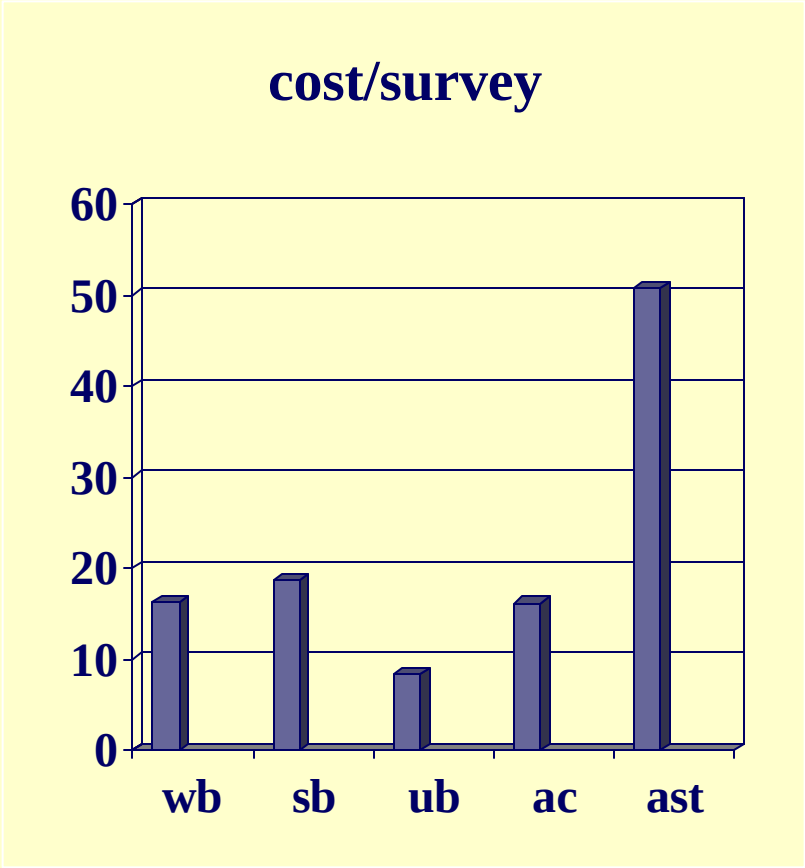


Big Question/guiding principals

- What will the indicator “look like”?
- Who will use it?
- How does it fit into existing monitoring programs?

Cost of monitoring

- Pilot study in 2001
- Refine methods
- Cost analysis
- Variability assessment
- Best bets



Clients will influence indicator development

Client	Monitoring Data collection	Indicator Sophistication
Federal	Citizen Scientist/fed emp	High
Regional	State, Tribal, Citizen Scientist	High-Moderate
Local private landowner/	Local, private landowners,citizen scientist	Low

Success of monitoring

- See the big picture
- Use standard methods
- Get help with design
- QA/QC especially with volunteers
- Adapt